



## Ovarian Teratoma in Pediatric: A Case Series

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### Abstract

**Introduction:** Ovarian teratoma is one of the most common tumor types in pediatric ovarian tumor. Ovarian tumor is rare, which constitutes only 1% of all tumors in pediatric patients. Both imaging and laboratory tools are needed and the management in the past decades seems to be giving good outcome.

**Case Series:** We report 11 cases of ovarian teratoma who came to our institution during the period of 2016-2019.

**Conclusion:** Proper examinations should be done in diagnosing ovarian teratoma. Surgery (tumor excision along with or without oophorectomy or salpingo-oophorectomy) and chemotherapy (in malignant teratomas) are the standard therapy for ovarian teratoma and appeared to be quite satisfying result.

**Keywords:** Ovarian teratoma; Pediatric; Salpingo-oophorectomy

### Introduction

Ovarian teratoma is one of the most common tumor types in pediatric ovarian tumor. Ovarian tumor is rare, which constitutes only 1% of all tumors in pediatric patients. About 47% to 87.7% of this tumor are germ cell tumors in pediatric age, while only 10% are malignant, yet in women, ovarian germ cell tumors account for 20% to 25% of all ovarian neoplasm, but only 3% to 5% are malignant. A study in Japan conducted by Oue et al., incidence of mature teratomas was 61% and incidence of malignant tumors was 9.8%. Diagnostic tools needed to diagnose this are blood serum levels of AFP, beta-hCG, and sometimes LDH, Ca-125, Ca 19-9 and CEA, and imaging studies. Oophorectomy followed by chemotherapy (in malignant type) are routinely performed in managing ovarian tumor. Over the past 3 decades, germ cell tumor survival rates have improved with more aggressive surgical staging and combination chemotherapy [1,2].

In this series of 11 cases, we described the clinical finding, other examination findings, management and outcome of pediatric patients with ovarian teratoma in the last 4 years in Dr. Soetomo General Academic Hospital.

### Case Series

#### Case 1

An 11 year old girl with a complaint of abdominal mass in the lower left quadrant for 3 months. She also complained of intermittent abdominal tenderness, without any symptoms of bowel obstruction. Her abdominal physical examination showed palpable mass from the infraumbilical region to left lower quadrant sized 10 cm × 8 cm × 5 cm, solid, flat surface, fixed and tender. Figure 1 shows patient's abdominal physical examination. Abdominal CT scan (Figure 2) showed heterogenic enhancing solid mass, irregular edge, size of 12.6 cm × 7.6 cm × 11.8 cm at the abdominal to pelvic cavity. Patient's AFP, β-HCG and LDH were 2.1 ng/ml, <2 mIU/ml, and 826 ng/ml respectively. Tumor excision along with left salpingo-oophorectomy were then performed and the mass was found on the left ovary, well localized without any seeding to surrounding tissues. It was diagnosed as left ovarian teratoma. Pathological examination showed the mass as germ cell tumor which was dysgerminoma. Cisplatin and etoposide were given afterwards. Patient had been regularly followed up in the next 6 months and her abdominal CT showed no mass in the abdominal or pelvic cavity/surgical bed with decreased level of AFP, beta-hCG, and LDH.

#### Case 2

Seven-year old girl was brought to the pediatric surgery outpatient clinic because her abdomen

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Figure 1: Patient's abdominal clinical appearance.

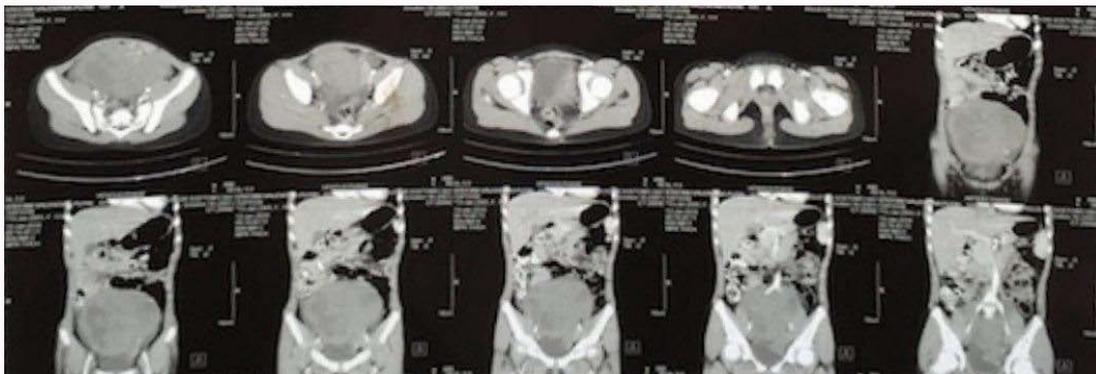


Figure 2: Abdominal CT showed mass with in abdominal and pelvic cavity.



Figure 3: Abdominal ultrasound showing ovarian mass.

seemed to be larger in the past 1.5 months before hospital admission. Size of the abdominal mass was approximately 10 cm × 7 cm × 10 cm on palpation. There was no complaint related to defecation or urination. Abdominal ultrasound (Figure 3) revealed solid mixed with cystic mass, well-defined, size of 10.9 cm × 6.92 cm, round shaped on the left adnexa suggesting ovarian teratoma. The AFP was 0.4 ng/ml and β-HCG was <2 mIU/ml. Tumor excision and left salpingo-oophorectomy were also done in this patient and we found mass on the left ovary without any seeding to surrounding tissues. Pathological result of the excised tumor was ovarian cystic mature teratoma (consisting of skin epidermal layer along with the sebaceous gland, hair follicle, fat tissue and bone cartilage). Intraoperative documentation is shown in Figure 4, 5. Outcome of this patient after operation has been showing no recurrence.

**Case 3**

Female, 14-years old was referred to our hospital being diagnosed with teratoma. She had complained of abdominal mass with abdominal enlargement since the past 2 months until she was admitted to the hospital. She then had abdominal pain and tenderness on her lower

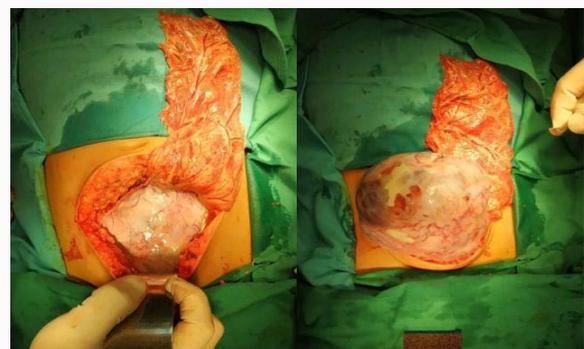


Figure 4: Operative finding in 7-year old girl with left ovarian teratoma.

abdomen which then spread to the lumbar region. From her physical examination, there was an abdominal distension with palpated mass (20 cm × 10 cm × 25 cm), solid, ill-defined, and irregular surface. Her abdominal CT (Figure 6) showed abdominal and pelvic cavity mass with a size of 18.7 cm × 11.17 cm × 25 cm mixed of solid, cystic and



Figure 5: Excised ovarian mass.

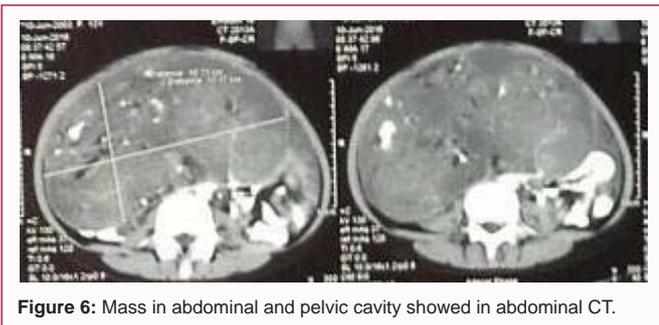


Figure 6: Mass in abdominal and pelvic cavity showed in abdominal CT.



Figure 7: Ultrasound revealing solid mass at the right ovary with ascites.

calcification suggesting ovarian teratoma with right hydronephrosis. AFP result was high (469.2 ng/ml) and Ca-125 of 459.1 U/ml. Tumor excision with left salpingo-oophorectomy and omentectomy were performed, and the pathological finding revealed that it was immature ovarian teratoma with implantation into the omentum. After surgery, she was given chemotherapy of etoposide, cisplatin and bleomycin. The evaluation result was satisfying with no mass recurrence with AFP level decreased to 26 ng/ml.

**Case 4**

Five-year old girl with a chief complaint of abdominal mass since 2-years prior to hospital admission. The mass was small which then seemed to get larger as the size of adult’s hand palm. She had been complaining of abdominal pain 2 days before being admitted to the hospital with fatigue and vomiting. Her abdomen was distended and there was palpable mass at the lower to upper right quadrant, mobile ill-defined, and tender. Her serum AFP increased (>1000 ng/ml), also the LDH level (984 ng/ml), and Ca-125 of 435.5 U/ml, with normal range of β-HCG. Ultrasound examination, in Figure

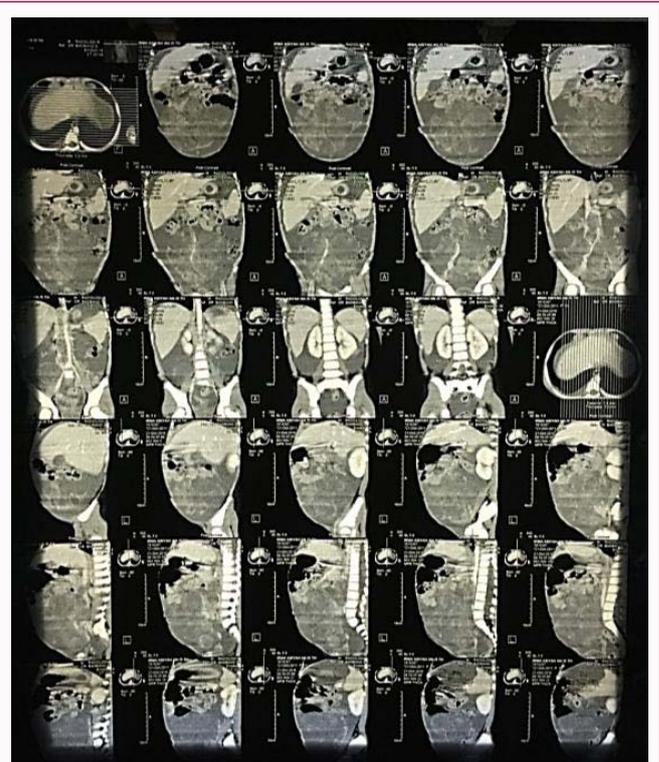


Figure 8: Abdominal CT showing solid mass from the internal genitalia (ovary).

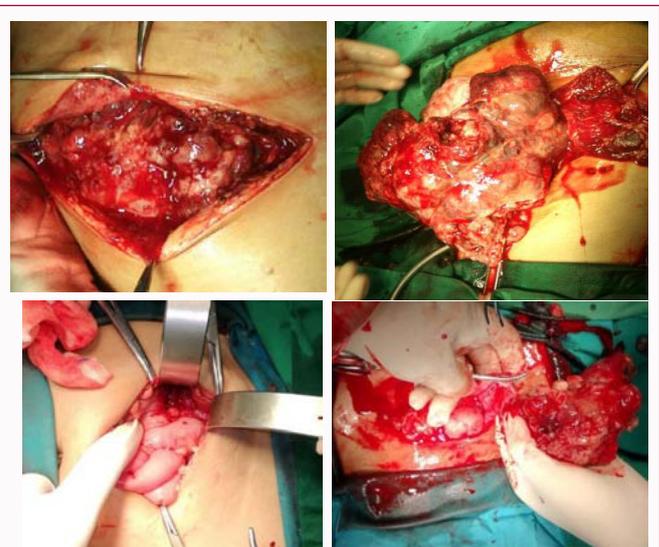
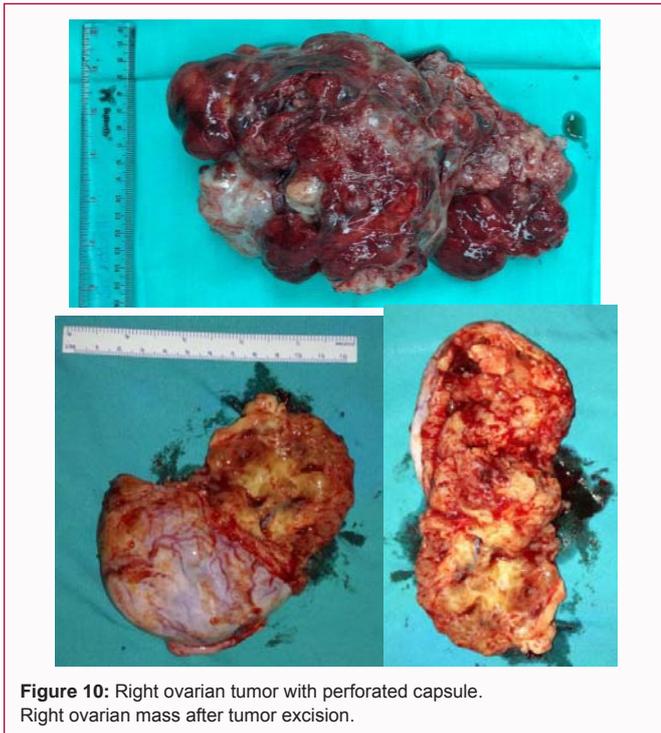


Figure 9: Intraoperative finding of right ovarian tumor with omental seeding. Right ovarian tumor with perforation at the posterior side, seeding into the mesosigmoid and walling off towards the mesosigmoid.

7, revealed solid mass, heterogenic echo parenchymal with a size of 6.36 cm × 5.37 cm at the right ovary with ascites. Her AFP result was >1000 ng/ml. Abdominal CT showed (Figure 8) solid mixed with cystic mass from the ovary with a size of 8.71 cm × 7.79 cm, ascites and right pleural effusion. Intraoperative finding showed serous-hemorrhagic peritoneal fluid, right ovarian tumor (8 cm × 5 cm × 3 cm) with perforated capsule, para-aorta lymph enlargement and omental tumor seeding (Figure 9, 10). Tumor excision along with right salpingo-oophorectomy and omentectomy were performed and



**Figure 10:** Right ovarian tumor with perforated capsule. Right ovarian mass after tumor excision.

she was given chemotherapy afterwards. Patient’s pathological result was right ovarian tumor suggestive of yolk sac tumor penetrating the capsule with metastasis to the omental and peritoneum. One month postoperative and chemotherapy, another abdominal CT to evaluate the mass was performed and showed no lesion nor mass in the abdominal and pelvic cavity, but there was moderate-severe right hydronephrosis with bilateral pleural effusion and para-aorta lymphadenopathy at the level of L1-L5. She received chemotherapy of bleomycin and etoposide, but then she was then hospitalized because of the kidney failure and severe pleural effusion, but her kidney function status kept decreasing, the chemotherapy was stopped and replaced with palliative care. This patient passed away 6 months after surgery.

**Case 5**

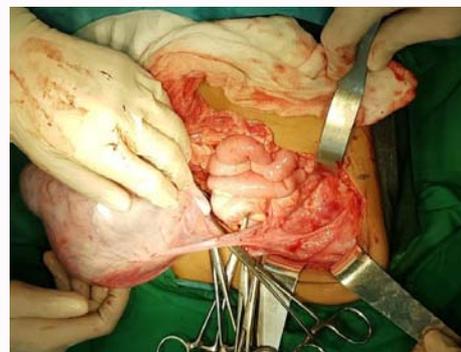
An 8-year old girl with intermittent abdominal pain for 7 days before being admitted to the hospital at the left lower quadrant, especially when palpated. She felt an enlargement of her abdomen, too. In the physical examination, her abdomen was not distended, normal peristaltic sound with palpable mass at the left lower quadrant, size of 8 cm × 14 cm × 10 cm and tenderness at the site of the mass. There was an increase of AFP (679.4 ng/ml) with normal β-HCG. Her abdominal CT revealed enhancing solid mixed with cystic mass at the lower abdominal quadrant (probably from the right adnexa) towards pelvic cavity, and lymph node enlargement at the para-aorta, peritumoral, mesenteric and iliac. Tumor excision and left salpingo-oophorectomy were done and right ovary tumor was found, size of 12 cm × 12 cm × 10 cm, perforated at the posterior side with intra-abdominal spillage, seeding to the mesosigmoid and omental part. This intraoperative finding can be seen in Figure 9, 10. Left ovary and uterus seemed to be normal, and there was no infiltration into the urinary bladder. Pathological examination result was ovarian yolk sac tumor, thereafter she received chemotherapy regimen consisting of cisplatin and etoposide. Her evaluation CT 6 months later showed no mass, and her AFP level decreased to 3.3 ng/ml.

**Case 6**

Six-year old patient, female with abdominal enlargement in the past one year with abdominal pain 2 months prior to hospital admission. She also com in physical examination, there was a palpable abdominal mass in the left lower quadrant with diameter size of 10 cm. AFP serum found increased (115.04 ng/ml) with normal β-HCG. Level of CEA, Ca-125 and Ca-19-9 serum was 2.12 ng/ml, 72.9 ng/ml and 216.26 ng/ml respectively. During the operation, there was found left ovary tumor retroperitoneally with a size of 18 cm × 12 cm × 15 cm, capsulated, multilobulated attached to the omentum with no seeding. In two left ovary teratoma excision was performed. Tumor can be seen in Figure 11, 12. Pathological result revealed as left ovary mature teratoma. Outcome after surgery a month later showed no recurrence with good clinical condition.

**Case 7**

One-year old female with abdominal mass since 3 months before being admitted to the hospital. The mass had been getting larger with no tenderness. Abdominal solid mass was palpated on the right illiacal region of abdomen, 17 cm × 15 cm. AFP and β-HCG serum level was normal (0.9 ng/ml) and <2.0 mIU/ml), while Ca-125 was found slightly increased of 38.2 U/mL. Abdominal CT-scan showed cystic capsulated mass with intramural nodule and intracystic calcification in the pelvic cavity to umbilical region, sized 15 cm × 10 cm × 18.2 cm. During operation, right ovary cystic mass was found, well-defined, gray-white colored, size of 15 cm × 10 cm × 15 cm. There was yellow-colored fluid and hair within the cyst. We performed right salpingo-oophorectomy. Conclusion of pathological examination confirmed this mass as mature ovarian teratoma. After surgery, patient was evaluated in the pediatric surgery outpatient clinic with no complaint of recurrent mass.



**Figure 11:** Left ovarian tumor identification, found retroperitoneally, attached to the omentum with mesenteric lymph node enlargement.



**Figure 12:** Left ovarian tumor (18 cm × 12 cm × 15 cm).

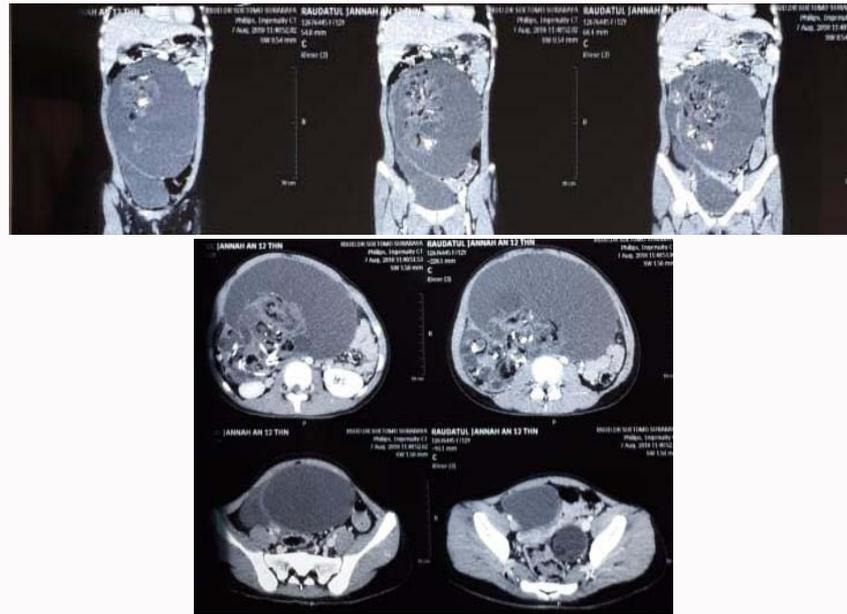


Figure 13: Abdominal CT of 12-year old girl with cystic abdominal mass.

**Case 8**

Female, 12-year old with a chief complaint of enlarging abdominal mass for 4 months prior to hospital admission. On abdominal inspection, there was bulging mass in all abdominal quadrants and there was a palpable, 20 cm × 19 cm solid mass. Patient’s AFP and β-HCG level was normal 0.7 ng/ml and <2 mIU/ml). Her CEA was 1.90 ng/ml with increased level of Ca-125 which was 84.6 U/mL. Abdominal CT (Figure 13) showed mass cystic lesion with calcification, sized 12.7 cm × 17.5 cm × 21.7 cm within the pelvic cavity towards umbilical region.

Bilateral salpingo-oophorectomy was performed along with excision of tumor parts that were attached to peritoneal and omentectomy. During surgery, we found red-colored mixed with music peritoneal fluid, tumor on the right adnexa 13 cm × 17 cm × 21 cm attached to abdominal wall and omentum (Figure 14). Left adnexa tumor (Figure 15) was also found, sized 4 cm × 4 cm × 4 cm, with hair and sebaceous tissue found within. Mature ovarian teratoma was revealed in pathological finding of both left and right ovaries with no healthy tissue in either ovary.

**Case 9**

Eight-year old girl complained about abdominal mass since a year before hospital admission and vaginal discharge mixed with blood. In the abdominal palpation, there was solid mass size of 9 cm × 9 cm × 20 cm, fixated. Her abdominal CT revealed multiloculated

septated with solid component in the middle and posterior side and calcification, size of 11.5 cm × 7.4 cm × 11.3 cm in pelvic cavity to abdominal cavity and suspected infiltration to the uterus and bowel, suggestive of malignancy. We performed tumor excision and right salpingo-oophorectomy after finding 18 cm × 13 cm × 7 cm right ovarian mass and its capsule was partly not intact on the superior side with omental walling-off and no intestinal infiltration, as seen in Figure 15. The tumor was excised, weighed 950 g and we found necrotic tissue with calcification within. Its pathological result showed grade 3 immature ovarian teratoma. Operative treatment was then continued with chemotherapy session (etoposide and cisplatin). Evaluation abdominal CT was performed five months later and showed no residual or recurrent mass.

**Case 10**

Eight-month old female child was referred to our institution with suspicion of ovarian teratoma. The chief main complaint was abdominal enlargement in the last 2 weeks before she was brought to the hospital. The enlargement was in all abdominal quadrants and she had history of red cell transfusion due to anemia which was suspected to be caused by tumor hemorrhage. There was abdominal distention (Figure 16) with palpable mass in the lower right quadrant, sized 5 cm × 8 cm, fixated. Her abdominal ultrasound revealed heterogenic solid mass within abdominal cavity sized 6 cm × 4 cm, well-defined, regular edge with massive ascites. Her abdominal CT (Figure 17) showed enhancing mass with different fluid density component, calcification inside, sized 5.6 cm × 6.4 cm × 6.1 cm in pelvic cavity to right inguinal quadrant, ascites and spina bifida. Red, flat surfaced mass on the right adnexa (Figure 18), attached to the peritoneal and also mass on the left ovary (size of 3 cm × 2 cm × 2 cm), with soft surface and bluish which bleed easily were found intraoperatively. The right ovarian tumor was attached to the peritoneum, but no seeding to the surrounding tissue was found. We performed bilateral oophorectomy with uterus preservation and marsupialization of both left and right ovary and omentectomy. Pathological result revealed an ovarian dysgerminoma from both ovarian tumors. This patient was evaluated and prepared to receive chemotherapy.



Figure 14: Malignant ovarian tumor in right adnexa.



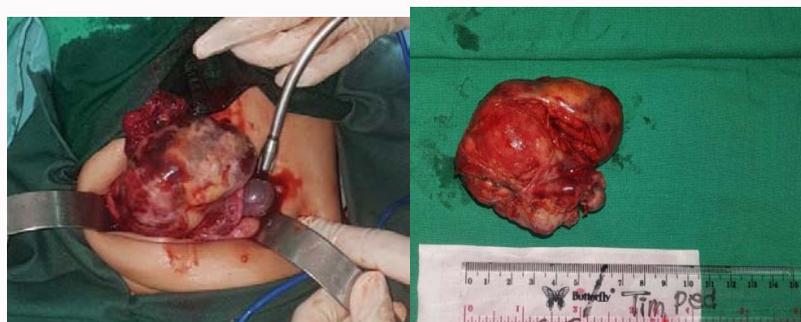
**Figure 15:** Cystic tumor of the left ovary. Right ovarian teratoma found during operation.



**Figure 16:** Abdominal distention with palpable mass and ascites found in physical examination.



**Figure 17:** Abdominal CT showing mass in the pelvic cavity and right inguinal quadrant.



**Figure 18:** Operative finding; tumor size of 7 cm x 6.5 cm x 3 cm from the right adnexa.

**Case 11**

Ten-year old girl was brought to the hospital, complaining of abdominal mass for 3 months prior to hospital admission. Her physical

examination showed palpable abdominal mass, size of 7 cm x 7 cm, cystic and mobile in the medial and right lower quadrant. Abdominal CT (Figure 19) showed. Her AFP and beta-hCG levels were normal



Figure 19: Abdominal CT of 10-year old girl with ovarian teratoma.

(1.1 ng/ml and <2 mIU/ml). Right salpingo-oophorectomy was performed on this patient after discovering cystic mass sized 6.5 cm × 4.5 cm × 0.8 cm, weighing of 23.7 gram which can be seen in Figure 20. Pathological finding of this tumor revealed mature cystic ovarian teratoma. She was then evaluated in the pediatric surgery clinic and her latest CT showed no residual or recurrent mass.

**Discussion**

Ovarian teratomas are the most common germ cell tumor and the most common excised ovarian neoplasm. Teratomas develop from totipotent primordial cells. Teratomas are categorized as mature, immature and malignant. Both mature and immature components are non-malignant tissues with uncertain metastatic potential. Malignant cells occur as other subtypes of germ cell tumors such as seminoma, choriocarcinoma, embryonal carcinoma and Yolk Sac Tumor (YST). Mature teratoma is the most common (45%) tumor



Figure 20: Right cystic ovarian mass in a 10-year old girl.

found in these serial cases (5 cases), while only 2 cases of immature teratoma, 2 cases of YST and 2 dysgerminoma in the last 4 years [3,4].

Primary ovarian tumors are uncommon (only 2% of all cancer types in pediatric population). Annual incidence of both benign and malignant lesions in girls younger than 15 years was 1.6 cases per 100,000. Predominant pathology of ovarian tumors in children it was predominantly germ cell tumors which account for 77.4% of all ovarian tumors in all age group. Asian/ Pacific islanders had higher overall rates of germ cell tumors [4-6].

In our cases, most common clinical presentations are abdominal pain and palpable abdominal mass. The masses are usually mobile and palpable above the pelvic brim. Duration of symptoms is usually short with median duration of 2 to 4 weeks. Acute symptoms may present in case of ovarian torsion, rupture or hemorrhage, which could be found in less common symptoms such as abdominal distention (35%) and vaginal bleeding (10%). We only found one patient showing symptom of vaginal bleeding in grade 3 immature ovarian teratoma. Secondary symptoms include anorexia, nausea, vomiting and urinary frequency and urgency, which we did not find in our cases [4,7].

Tumor markers that are commonly tested are Alpha Fetoprotein (AFP), beta-human Chorionic Gonadotropin (beta-hCG), and Lactate Dehydrogenase (LDH). We usually evaluate serum AFP and beta-hCG levels in pediatric patients with abdominal mass. AFP increases in yolk sac tumor and teratocarcinoma, and is usually re-measured for evaluating recurrence after treatment. Its elevation was shown in our immature ovarian teratoma and other malignancy cases. Beta-hCG elevation suggests presence of syncytiotrophoblast (seminoma, dysgerminoma, and choriocarcinoma), its rapid disappearance indicates complete tumor removal [4].

Table 1: COG ovarian germ cell tumors staging system.

Stage I	Limited to ovary (ovaries) peritoneal washings negative, tumor markers normal after appropriate half-life decline
Stage II	Microscopic residual; peritoneal washings negative for malignant cells, tumor markers positive or negative
Stage III	Lymph node involvement; gross residual or biopsy only, contiguous visceral involvement (omentum, intestine, bladder); peritoneal washing positive for malignant cells, tumor markers positive or negative
Stage IV	Distant metastases, including liver

Table 2: Survival for ovarian cancer, POG/CCG intergroup trial 1990-96.

Stage	Treatment	6-year free survival (%)	6-year survival (%)
I	S + PEB	95	95.1
II	S + PEB	87.5	93.8
III	S + HDP/EB vs. PEB	96.6	97.3
IV	S + HDP/EB vs. PEB	86.7	93.3

B: bleomycin; E: etoposide; B: bleomycin; P: cisplatin; HDP: high-dose cisplatin; S: surgery

Imaging techniques that are commonly used are ultrasound and abdominal CT. Our cases with mature teratoma, showed cystic mass found both in abdominal ultrasound and/or CT. Three manifestations found in mature teratoma in ultrasound are cystic lesion, diffuse or partially echogenic mass and consisting of multiple thin and echogenic bands caused by hair in the cyst cavity, while mix of solid-cystic masses or nonspecific imaging are revealed in imaging in other germ cell tumors, like in immature ovarian teratoma or other ovarian malignancy. Immature teratomas are typically larger with perforation of its capsules, which are not always well defined [4,5].

Staging system in ovarian germ cell tumors is based on its clinicopathological findings, which was arranged by Children's Oncology Group (OCG) as seen in Table 1 [8].

Management of germ cell tumors begins with surgical management. The goal of surgery is to completely evaluate the extent of disease, resect the tumor completely and spare uninvolved reproductive organs, especially in children. Conservative surgery with unilateral salpingo-oophorectomy and thorough contralateral ovarian inspection during surgery, with biopsy of suspicious lesion and careful staging is mandatory. Staging (by inspection, palpation and biopsy of any suspicious peritoneal or liver nodules) should be performed prior to surgical resection if characteristic between benign and malignant tumor is difficult to distinguish. Both ovarian inspections should be done intraoperatively; oophorectomy is performed if there's no involvement of fallopian tube, while salpingo-oophorectomy is done when fallopian tubes are involved and because of the rich lymphovascular connections between tube and ovary. Unilateral salpingo-oophorectomy with preservation of normal uterus and contralateral ovary is an option in clinically early-stage disease. Evaluation of fertility in patients with unilateral oophorectomy showed that pregnancy rates appear to be the same as that of the general population. We mostly performed salpingo-oophorectomy of the involved ovary and fallopian tube to resect the tumor completely, in mature, immature and also malignant teratoma [4,9-11].

As mentioned before, sparing uninvolved reproductive organ is one of management's goals, and bilateral oophorectomy is rarely necessary, but there's also another consideration in patient with malignancy that complete staging and resection should be the first goal of the surgery. In our cases of bilateral ovarian teratoma, we decided to perform bilateral salpingo-oophorectomy. In one case, one ovary side was pathologically malignant and the other one was benign, because it was rather difficult to decide its mass characteristic intra- and pre-operatively (since imaging studies revealing mixed consistency of mass, differentiation to benign and malignant tumors based on radiological finding is not possible) and complete staging and resection should be the first goal of surgery in malignancy, either to reduce the risk of recurrence and mortality in inadequate surgical removal, we did bilateral salpingo-oophorectomy. On another case of bilateral ovarian teratoma, both ovarian tumors were found to be malignant (dysgerminoma); we also performed bilateral salpingo-oophorectomy. Also, there is a consideration of ovarian preservation, which is size of the tumor (tumor size larger than 15 cm causes the ovary to be very thin owing to the large tumor, thus ovary preservation appeared to be difficult) [10,12-14].

There are two options of surgical technique that can be performed, which are laparoscopy and laparotomy. Laparoscopy can be done in tumor with size of less than 75 mm, to take peritoneal fluid

sampling, peritoneal inspection and tumor evaluation. If there's no seeding or adhesion with easy tumor enucleation can be done, then laparoscopy shall be continued, otherwise if the tumor size is larger than 75 mm, with peritoneal seeding and adhesion, laparotomy must be performed. In these cases, we performed laparotomy surgery in all cases because the sizes of ovarian tumors were mostly larger than 77 mm, and the use of laparoscopy at our center is still limited [10].

Platinum-based therapy (regimen of cisplatin, etoposide and bleomycin) is the current regimens used in ovarian germ cell tumors. This regimen is given in malignant teratoma, including immature teratoma (especially in grade 2 and 3 of immature teratoma). Based on POG/CCG intergroup trial in 1990-1996, survival rate of ovarian cancer in chemotherapy of ovarian malignancy is shown in Table 2, using the COG staging system. Chemotherapy regimens used at our center is cisplatin (P), Etoposide (E) and Bleomycin (B), where both cisplatin and etoposide are more commonly used. Therapy is discontinued after pathologic complete response and normal tumor markers [4,8,10].

Germ cell tumors are mentioned to be sensitive to radiotherapy, but cost of the cure may be too high if it compromises patient's fertility, therefore radiation has been abandoned and multiagent chemotherapeutic program has been used for standard therapy in malignancy [10].

## Conclusion

Proper examinations (both physical and using diagnostic tools) should be done in diagnosing ovarian teratoma. Its management now seems to be adequate, which are surgery (tumor excision along with or without oophorectomy or salpingo-oophorectomy and chemotherapy (in malignant teratomas) are the standard therapy for ovarian teratoma and appeared to be quite satisfying result (10 out of 11 cases) in our experience with no signs of recurrence and good outcome.

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